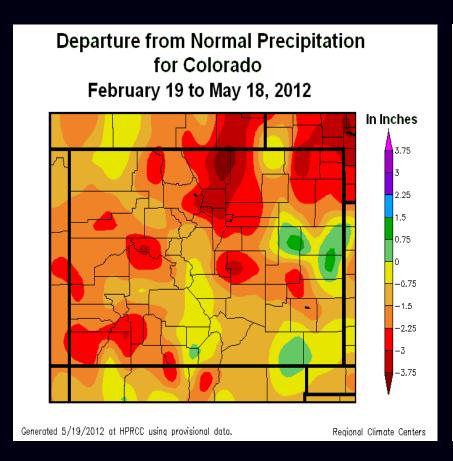
The
June-July-August 2012
Outlook
For The
Front Range Urban Corridor
and the
Rest of Colorado

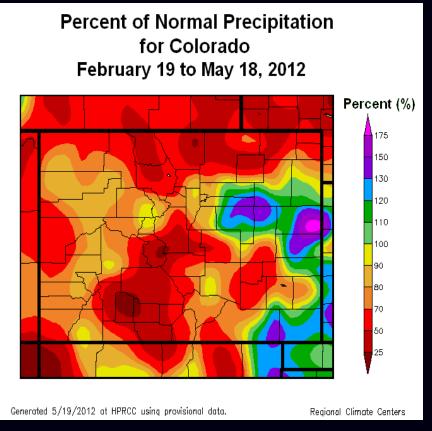
Mike Baker National Weather Service Boulder, Colorado May 24, 2012





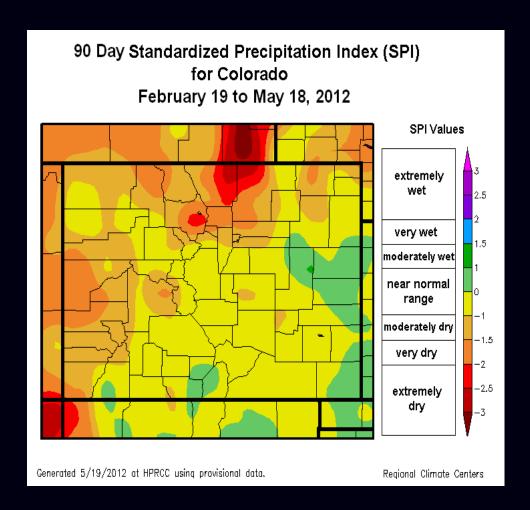






Precipitation in Colorado during the 90-day period February 19 to May 18, 2012, was below to much below average, with a few exceptions. Departures from normal ranged from nearly 4 inches below average along the northern Front Range centered in Larimer County, to just under an inch above average in Cheyenne and Kit Carson counties in east central Colorado.

Precipitation along the state's northern border and over the higher terrain in south central Colorado was as much as 25 to 70 percent of normal. Conversely, portions of east central and southeast Colorado saw precipitation totals as much as 150 percent of normal.

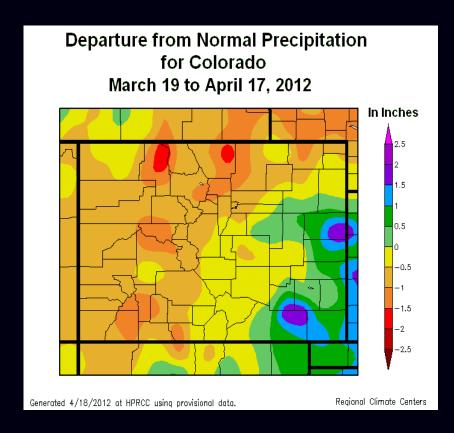


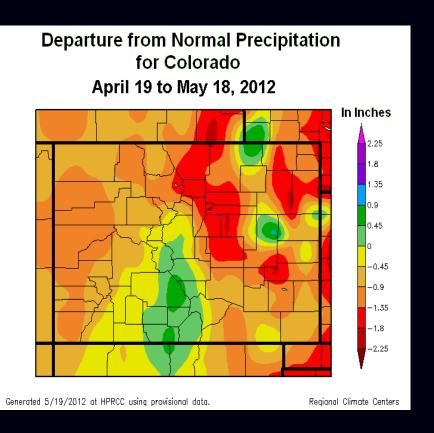
The Standardized Precipitation Index (SPI) for this same 90-day period, reveals dry to very dry conditions across most of Colorado, with extremely dry soils in eastern Larimer and northwest Weld counties in north central Colorado.

Exceptions include portions of east central and southeast Colorado where near normal to moderately wet soil conditions dominated during this 90-day period.

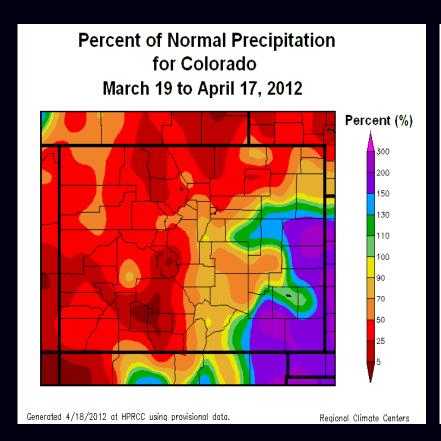
The SPI was developed to monitor potential short term agricultural and long-term hydrological drought conditions. The SPI is a probability index that considers <u>only</u> precipitation.

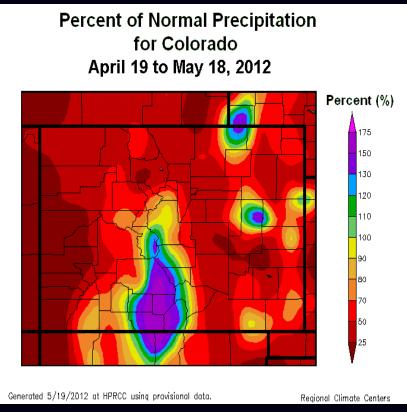






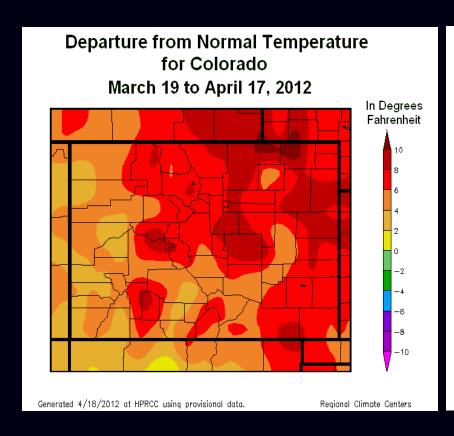
Precipitation for much of Colorado during the 30-day period ending May 18, 2012 (right map) continued to exhibit a downward trend, beginning back in March of this year. Precipitation surpluses in many areas turned to deficits during this 60-day period, with the greatest change occurring in eastern Colorado.

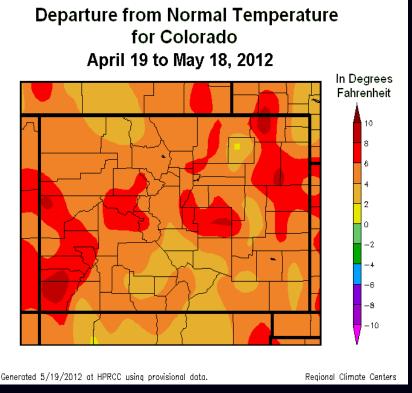




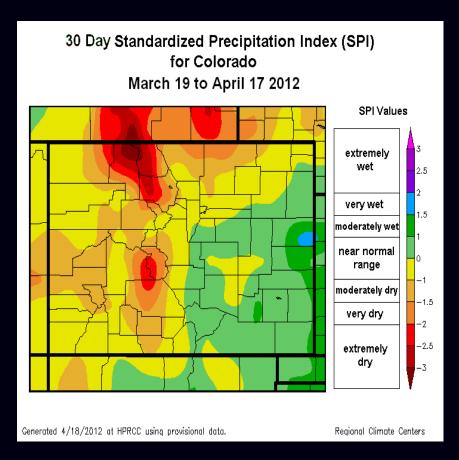
The drying trend during the past 60 days was most pronounced in southeast Colorado where precipitation totals went from around 300 percent of normal during the period March 19 to April 17 (left map) to a mere 25 percent of normal during the period April 19 to May 17 of this year (right map). Dramatic reductions in precipitation were also observed in western Colorado along the Utah border, in the upper Colorado River Basin centered in Grand County, and along the lee slope of the Front Range Mountains in eastern Colorado.

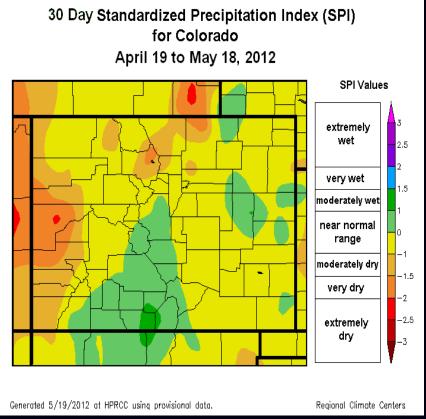
In contrast, the upper Rio Grande Basin and surrounding areas in south central Colorado witnessed above average precipitation during the 30-day period ending May 18<sup>th</sup>, with amounts ranging from 110 to 175 percent of average.





Temperature extremes moderated across central and eastern Colorado during the 30-day period ending May 18<sup>th</sup> (right map), after an abnormally warm March and early April. Departures, on average, ranged from 6 to 11 degrees (F) above normal. Whereas western Colorado saw a reversal in this temperature trend with departures as much as 8 degree (F) above average, up from the zero to 4 degree (F) positive anomalies observed during the 30-day period ending April 17<sup>th</sup> (left map).





The Standardized Precipitation Index (SPI) for the 30-day period ending May 18<sup>th</sup> indicated near normal to moderately dry soil conditions for much of Colorado, with pockets of very dry conditions along the Utah and Wyoming borders. The SPI also indicated near normal to moderately wet soil conditions in portions of central, south central and eastern Colorado.

The northwest portion of Colorado saw the greatest improvement in soil moisture during this 60-day period.

## U.S. Drought Monitor

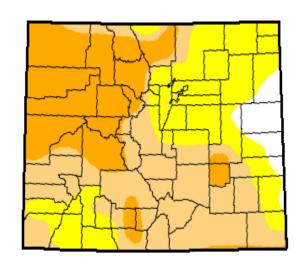
May 15, 2012

Valid 7 a.m. EST

#### Colorado

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5.15	94.85	64.57	28.49	0.00	0.00
Last Week (05/08/2012 map)	5.13	94.87	61.81	29.40	0.00	0.00
3 Months Ago (02/14/2012 map)	30.48	69.52	41.07	10.67	0.21	0.00
Start of Calendar Year (12/27/2011 map)	67.79	32.21	24.98	14.94	0.04	0.00
Start of Water Year (09/27/2011 map)	60.62	39.38	27.69	19.99	7.88	0.56
One Year Ago (05/10/2011 map)	39.59	60.41	52.58	40.72	3.25	0.00



#### Intensity:





D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu

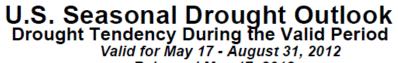




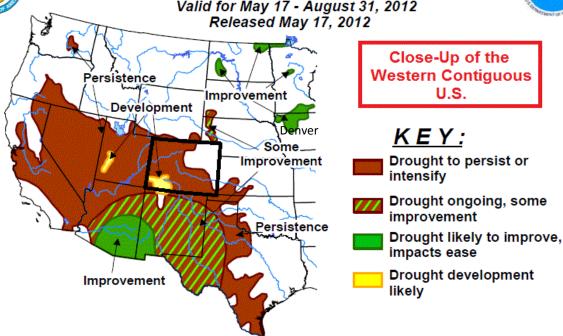




Released Thursday, May 17, 2012 Brad Rippey, U.S. Department of Agriculture According to the U.S. Drought Monitor, as of May 15, 2012, drought conditions in Colorado ranged from severe (D2) across northwest and west central portions of the state, with pockets of severe drought (D2) in south central and southeast Colorado, to abnormally dry conditions (D0) in southwest and northeast Colorado. Moderate drought conditions (D1) were indicated for the remainder of the state.





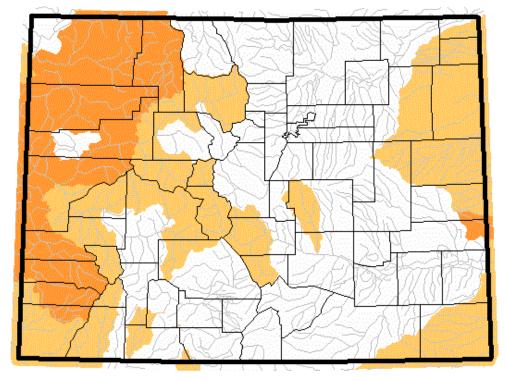


Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

The seasonal drought outlook for Colorado (outlined in black) during the period May 17 to August 31, 2012 calls for drought to either persist or intensify across most of Colorado. Exceptions include the northeast plains of the state where drought is not anticipated, and extreme southwest Colorado along the south face of the San Juan Mountains where drought is likely to develop.

The map below depicts the normal 7-day average streamflow in Colorado compared to historical streamflow for May 18, 2012.

Friday, May 18, 2012



**USGS** 

Explanation - Percentile classes						
Low <=5 6-9 10-24 insufficient data						
	<=5	6-9	10-24	Insufficient data for a hydrologic		
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	region		

Source: U.S. Department of the Interior, U.S. Geological Survey: http://waterwatch.usgs.gov

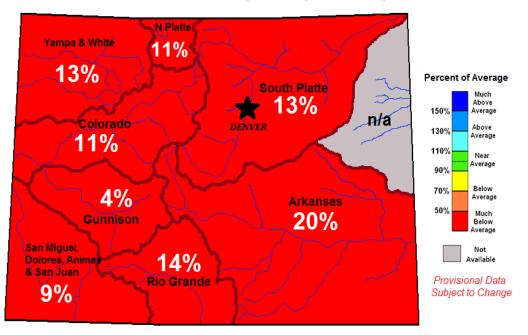
According to streamflow data from the USGS, moderate hydrological drought conditions (orange shading) were present across much of western Colorado during the 7-day period ending Friday, May 18, 2012.

The colors on this map represent 7-day average streamflow precentiles based on historical streamflow for the day of the year indicated.

Only streamflow recording stations having at least a 30 year record are used.

The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

#### Colorado SNOTEL Snowpack Update Map



Snow Water Equivalent as a Percent of Average (%) for Colorado by River Basin as of May 18, 2012.

Basin Wide Percent of Average (%)

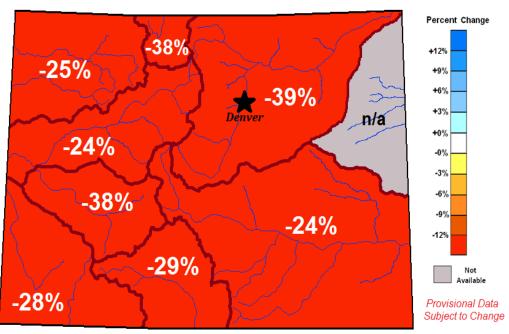
West Slope	East Slope
Yampa & White River Basins 13% Upper Colorado River Basin 11% Gunnison River Basin 4%	Laramie & North Platte Basin 11% South Platte River Basin 13% Arkansas River Basin 20%
San Migual, Dolores Animas & San Juan River Basins 9% Upper Rio Grande Basin14%	Statewide Avg 9%

Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

As of May 18, 2012, the average snowpack (snow water equivalent) for the entire state of Colorado was a mere **9 percent** of average.

The state's lowest average basin-wide snowpack was observed in the Gunnison River Basin (4 percent) and the San Miguel, Dolores, Animas and San Juan River Basin in southwest Colorado (9 percent). Snow water equivalents in the state's remaining basins were not much better, and only slightly better than the statewide average.

#### Colorado SNOTEL Snow Water Equivalent Change Map



Percent of Change of Snow Water Equivalent Per River Basin in Colorado from April 18 to May 18, 2012

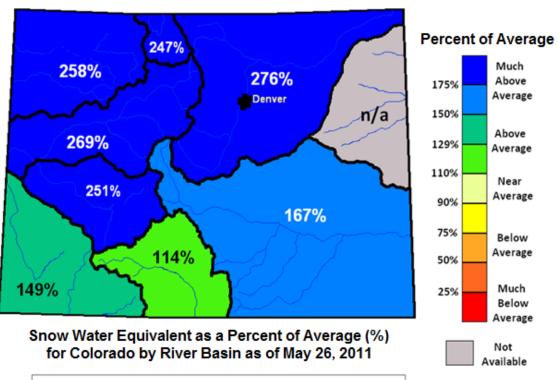
West Slope	East Slope
Yampa & White River Basins25% Upper Colorado River Basin24% Gunnison River Basin38% San Migual, Dolores Animas	Laramie & North Platte Basin38% South Platte River Basin39% Arkansas River Basin24%
& San Juan River Basins28% Upper Rio Grande Basin29%	Statewide Avg30%

Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

From April 18 to May 18 of this year, snow water equivalent for the state of Colorado decreased significantly by an average of 30 percent.

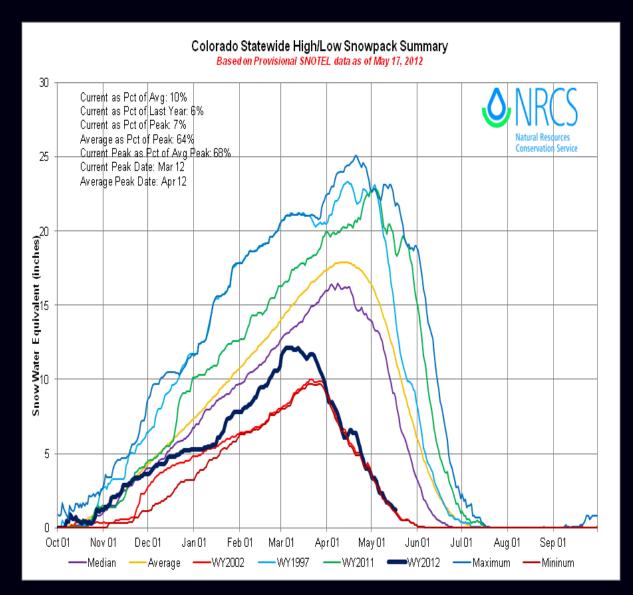
The South Platte River Basin saw the greatest basin-wide decrease of 39 percent, with the Gunnison River Basin close behind at 38 percent.

#### Colorado SNOTEL Snowpack Update Map



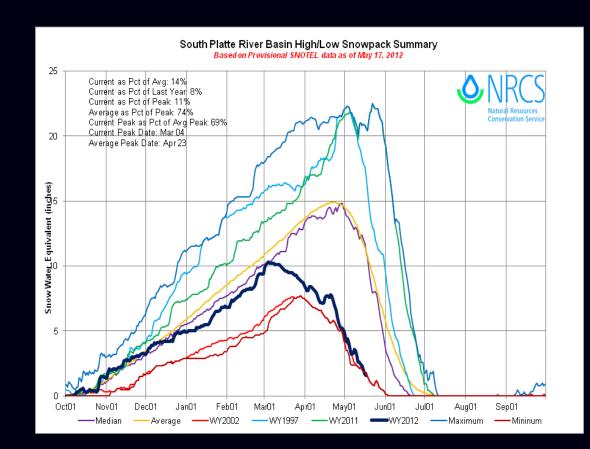
WEST SLOPE	EAST SLOPE
Yampa and White River Basins 258%	Laramie & North Platte Basin 247%
Upper Colorado River Basin 269%	South Platte River Basin 276%
Gunnison River Basin251% San Miguel, Dolores, Animas &	Arkansas River Basin167%
San Juan River Basins149% Upper Rio Grande Basin114%	Statewide Avg 239%

Source: USDA Natural Resources Conservation Service--Water and Climate, Portland, Oregon provisional data, subject to revision The statewide average snow pack (snow water equivalent) as of May 17th, 2012 was an impressive 230 percent below the near record snowpack observed at about the same time as last year!



The average state-wide snowpack (snow water equivalent) as of May 17, 2012 (indicated by the thick dark blue line) continued to lag far behind the pace observed in mid-May of the near record snowpack winter seasons of 1996-1997 (light blue line) and 2010-2011 (green line).

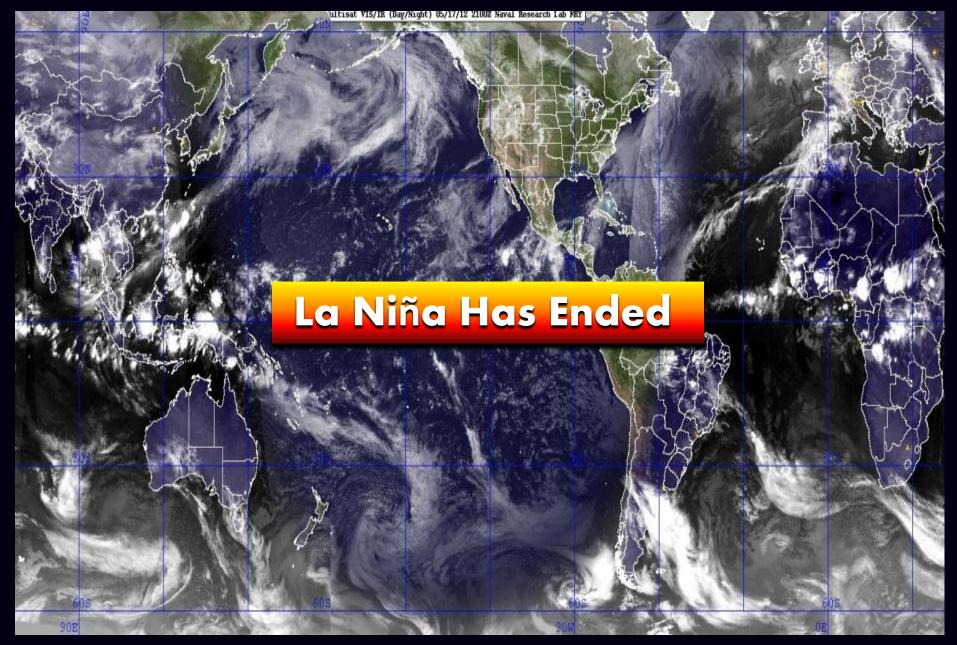
The average state-wide snowpack as of mid-May of this year was very similar to that observed during the near record minimum snowpack of the 2001-2002 winter season (lighter red line.)



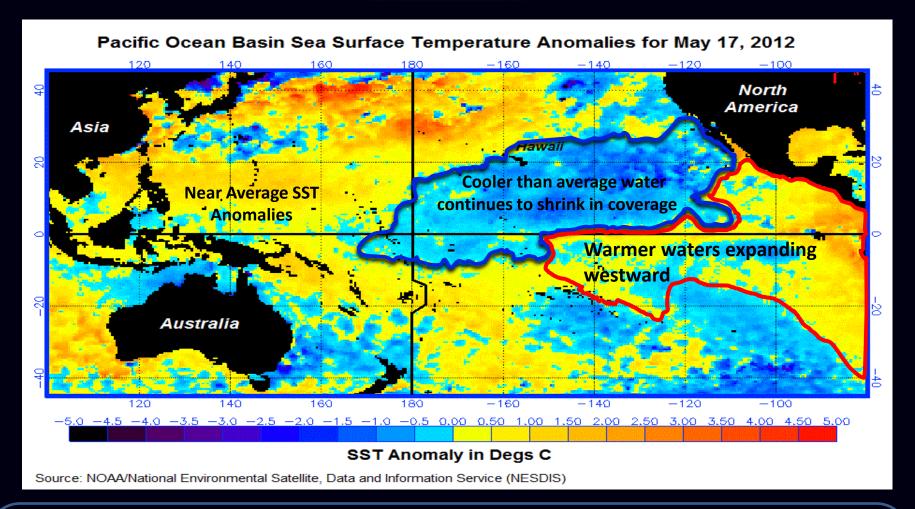


Yellow dots – reporting SNOTEL sites

The average snow water equivalent for the South Platte River Basin in northeast Colorado (see map in upper right) for the 2011-2012 winter season (the thick dark blue line in upper left) was nearly as dismal as that observed during the near record minimum snowpack of 2001-2002 (lighter red line). Although basin-wide snow water equivalents earlier this winter season were not as low as those at the same time in 2002.

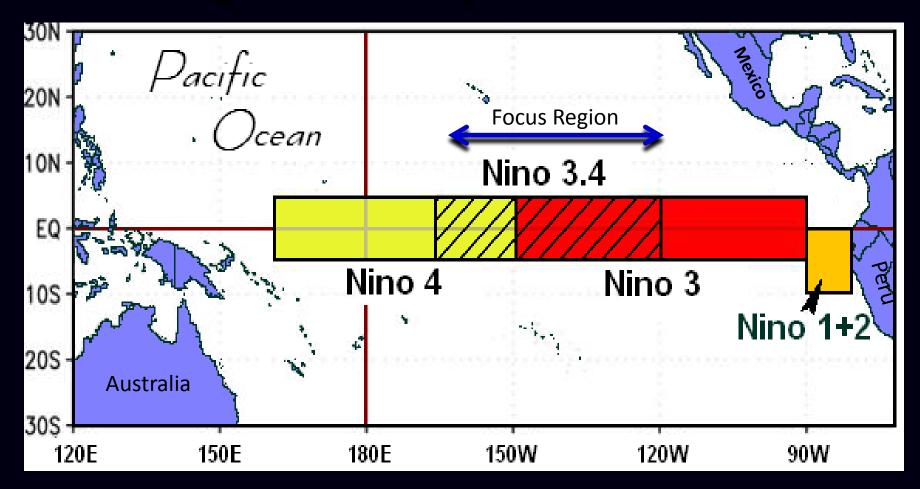


Source: U.S. Naval Research Lab MRY

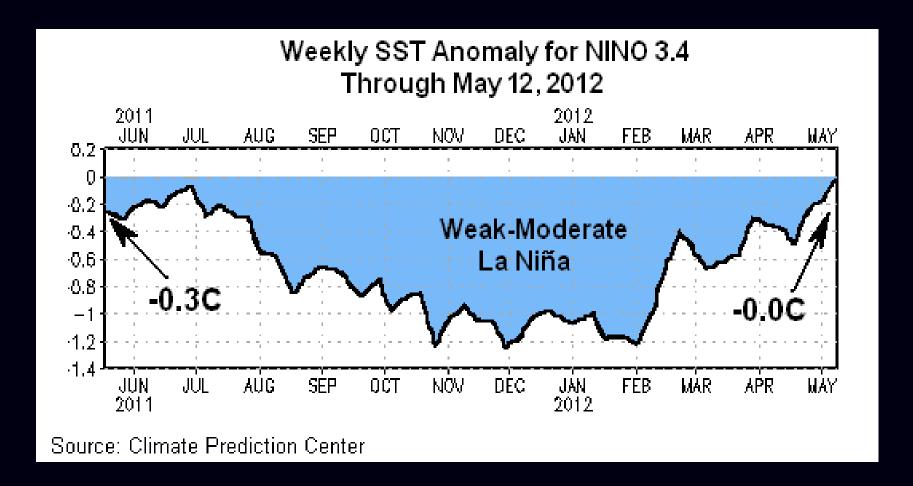


La Niña was no longer as of the end of April. Below average sea surface temperatures (SST) once present in the central and eastern tropical Pacific Ocean have warmed to near average or slightly above average in the past few weeks. The negative SST anomalies off the west coast of North America and down across the central subtropical Pacific Ocean have also continued to warm. Furthermore, SST anomalies in the western equatorial Pacific around Indonesia and northern Australia have moderated to near average. This is an indication that neutral ENSO (El Niño-Southern Oscillation) conditions have returned to the Pacific Basin.

## Niño Regions in the Equatorial Pacific Ocean



Niño 3.4 – The principal region in the eastern Equatorial Pacific Ocean used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO (hatched region on the above map).



As of May 12, 2012 the weekly SST anomaly for Niño 3.4 region was -0.0C. One year ago, the SST anomaly was -0.3C. Weekly SST anomalies in Niño 3.4 have steadily increased in a positive direction during the past four weeks. A SST anomaly of -0.45°C or lower is an indicator of La Niña, and above -0.45°C and below +0.45°C neutral ENSO conditions.

## The Latest Oceanic Niño Index - ONI

Year	DJF	JFM	FMA	MAM	АМЈ	МЈЈ	JJA	JAS	ASO	SON	OND	NDJ
2000	-1.7	-1.5	-1.1	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.6	-0.8	-0.8
2001	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.3
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
2003	1.1	8.0	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.1	0.3	0.5	0.7	0.7	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.3	-0.6	-0.9	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.4	-0.7
2009	-0.9	-0.8	-0.6	-0.2	0.1	0.4	0.5	0.6	0.7	1.0	1.4	1.6
2010	1.6	1.4	1.1	0.7	0.2	-0.3	-0.8	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.3	-1.0	-0.7	-0.4	-0.2	-0.2	-0.3	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.7	-0.5									

NOAA/CPC Last Update 05-04-12

The ONI -0.5 indicates the presence of a weak La Niña during the 3-month climate season FEB-MAR-APR, 2012.

El Niño : ONI higher than +0.45 Neutral ENSO : ONI lower than +0.45

and higher than -0.45

La Niña: ONI lower than -0.45

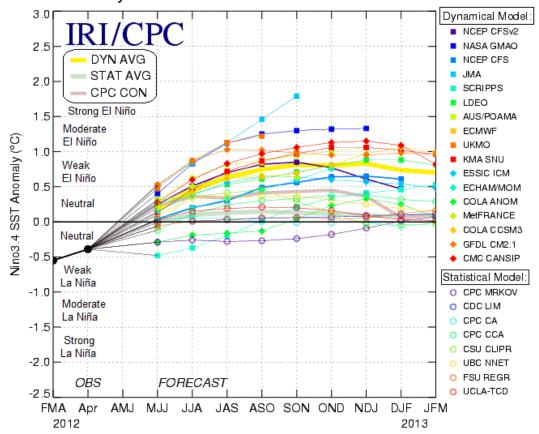
The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific Ocean. It is the principal measure used by NOAA's Climate Prediction Center (CPC) for monitoring, assessing and predicting El Niño/Southern Oscillation (ENSO.)

ONI is defined as the threemonth running-mean SST departures in the Niño 3.4 region.

ONI is used to place current ENSO and non-ENSO events into a historical perspective.

CPC's operational definitions of El Niño and La Niña are keyed to the ONI index.

#### Mid-May 2012 Plume of Model ENSO Predictions



Forecast SST Anomalies (deg C) in the Niño 3.4 Region

Seasons (2012-2013) M	JJ JJA	JAS	ASO	SON	OND	NDJ	DJF	JFM
Average, Dynamical Models: 0.	2 0.4	0.6	0.7	8.0	8.0	8.0	0.7	
Average, Statistical Models: -0.	0 0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average, All Models: 0.	1 0.3	0.5	0.6	0.6	0.5	0.5	0.4	0.4

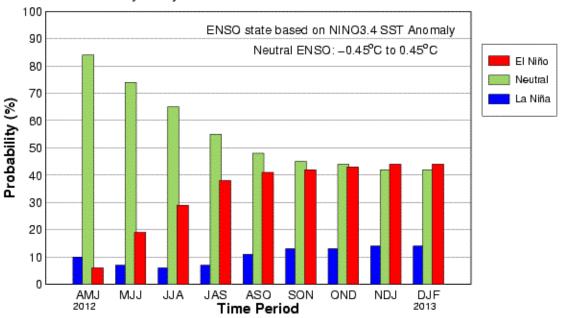
Source: The International Research Institute for Climate and Society (IRI)

### **The ENSO Outlook**

Although a majority of the dynamical and statistical models predict a continuation of neutral ENSO conditions through the middle of the summer (June-August), slightly more than half of the models predict the development of El Niño conditions around the July-September climate season, and a continuation through the remainder of 2012.

Still, a sizable number (40-45%) of the models (largely dynamical models) predict a continuation of neutral ENSO conditions throughout 2012.

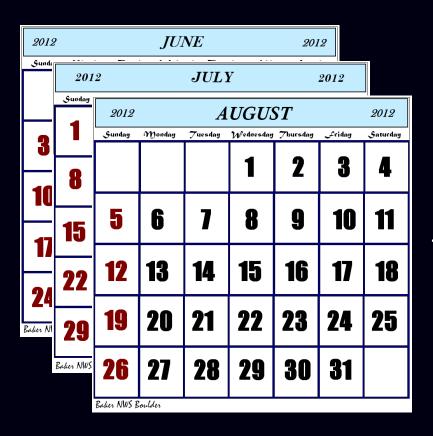
#### Official Early-May CPC/IRI Consensus Probabilistic ENSO Forecast



Season	La Niña	Neutral	El Niño
AMJ 2012	10%	84%	6%
MJJ 2012	7%	74%	19%
JJA 2012	6%	65%	29%
JAS 2012	7%	55%	38%
ASO 2012	11%	48%	41%
SON 2012	13%	45%	42%
OND 2012	13%	44%	43%
NDJ 2013	14%	42%	44%
DJF 2013	14%	42%	44%

According to model probabilities, it is clear that uncertainty remains regarding the state of ENSO during the second half of 2012.

Although, it is reasonably certain to conclude that La Niña conditions will not return for this summer and autumn (June-December) seasons.



## to the Next Three Months

Historical Trends in
Temperature and Precipitation
and the Latest
Outlook
From NOAA's
Climate Prediction Center

# June – Is Typically the Start to the Convective Severe Weather Season in Colorado









**Flash Flooding** 

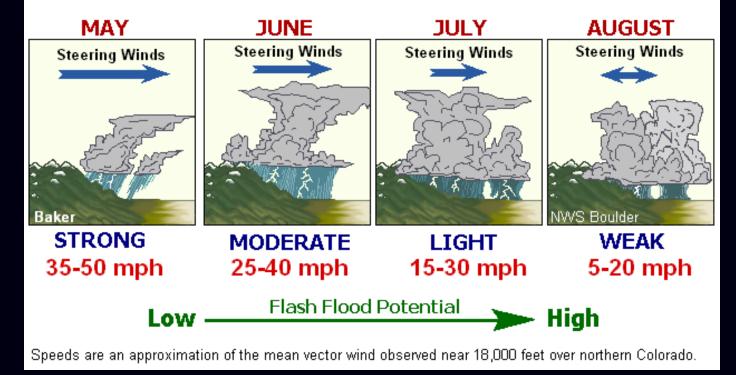
Hail

Potentially
Damaging
Thunderstorm
Winds

**Tornadoes** 

## Seasonal Change in the Steering Winds Aloft

Their Influence on Thunderstorm Movement and the Potential for Flash Flooding



Flash Floods

The risk of flash flooding significantly increases during June and peaks, on average, in late July and early August during the so-called summer "monsoon". This is a period of the year when steering winds aloft are typically at their weakest and the moisture content of the lower atmosphere along the Colorado Front Range is normally greatest. Flash flooding is more likely to occur with slow moving and stationary thunderstorms.

#### Influence of Slope and Vegetation on Rainfall Runoff







Potential for heavy runoff with rainfall rates of 2 to 4 inches per hour

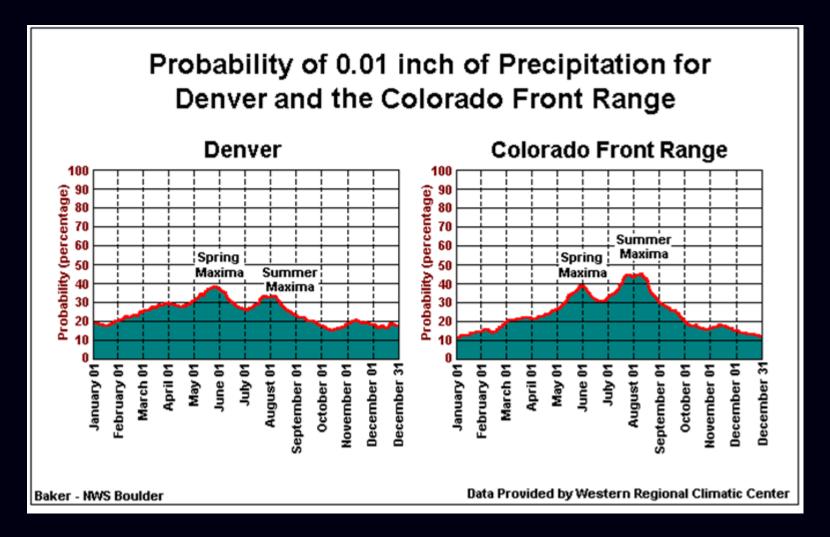
In addition to the speed of movement of a thunderstorm, the amount of rain (and hail) it deposits on a location and the time it takes for this to occur, other factors such as the slope of the terrain, the type and degree of vegetation and soil permeability play a significant role in the production of flash floods.

Baker - NWS Boulder

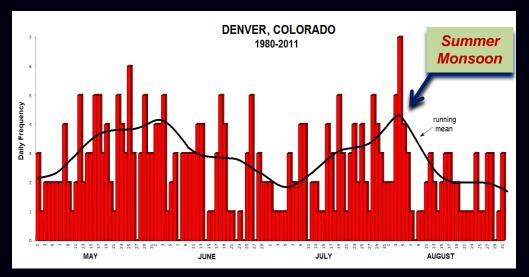


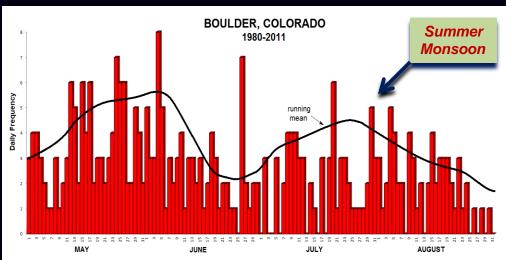
One should *never* rule out the possibility of *flash flooding*, particularly in steep mountainous terrain and in areas recently burned over by wildfire.

Thunderstorms can form suddenly over higher terrain several miles upslope from you without your knowledge. Flood waters can rush downstream from this storm without warning even as you sit under a cloud free sky.



The probability for measurable precipitation (at least 0.01 inch) peaks, on average, in late spring for Denver and in mid-summer for the Colorado Front Range. Note the reduction in precipitation probability at both locations in late June and early July.

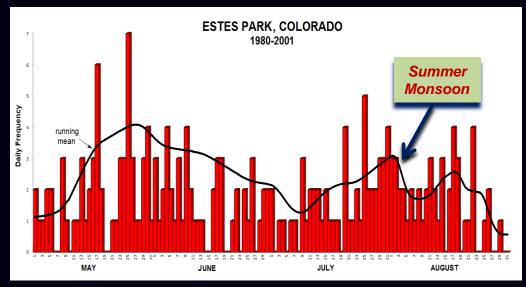


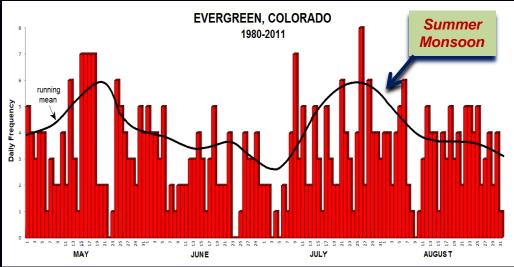


#### For Denver and Boulder...

The frequency of daily precipitation equal to or greater than 0.25 inch peaks, on average, in late May and early June and in late July and early August for the Denver-Boulder area. However, the potential for heavier rainfall resulting in *flash flooding* is greater in July and early August during a secondary precipitation maxima. This second peak in daily precipitation occurrence is often associated with the so-called *summer monsoon*, a period when slow moving thunderstorms capable of heavy rainfall increase in number.

An early-summer (late June-early July) precipitation frequency minima is evident in these precipitation plots, particularly for Boulder. This period of relative dryness often is associated the warmest temperatures of the summer.





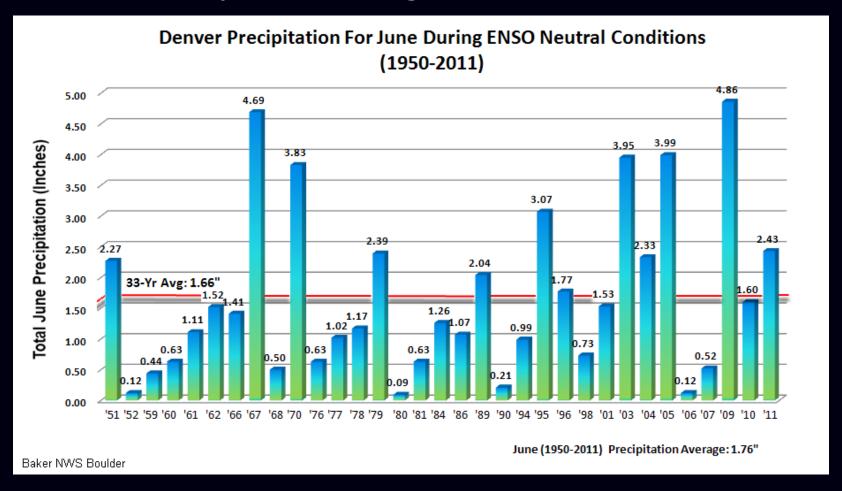
## For the Front Range Communities of Estes Park and Evergreen...

The frequency of daily precipitation equal to or greater than 0.25 inch peaks, on average, around mid-May and in late July for Estes Park and Evergreen, communities located in the Colorado Front range foothills.

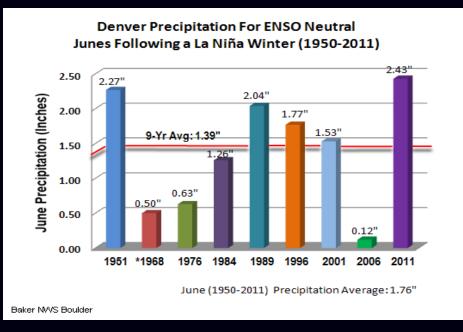
This mid-summer spike in precipitation frequency is due in large part to an increase in thunderstorm occurrence associated with the *summer monsoon*.

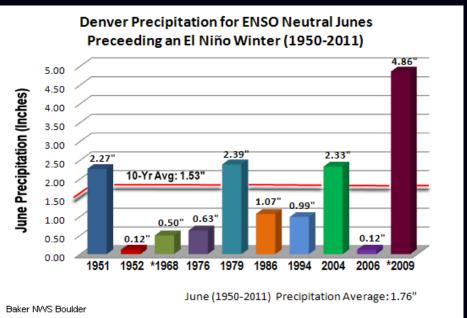
A reduction in the number of quarter inch rainfall days is evident on these plots for both locations during late June and early July. This dip in precipitation is similar to that observed for Denver and Boulder, located along the base of the Front Range in northeast Colorado.

## **June Precipitation During ENSO Neutral Conditions**



June precipitation in Denver, Colorado has been quite variable during ENSO neutral conditions since 1950. During the 33 Junes meeting this criteria, monthly precipitation has varied widely from a low of 0.09 inch in 1980, to an impressive 4.86 inches just recently in 2009. However, when averaged together, precipitation during ENSO neutral Junes was a mere 0.10 inch below the 1950-2011 average for all Junes at Denver.



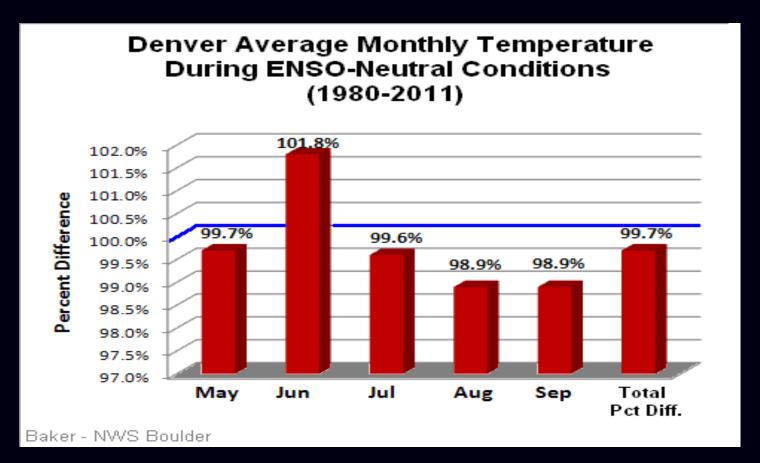


Two questions often asked; "How much precipitation do we normally see in Denver in the month of June during ENSO neutral conditions following a La Niña, and prior to an El Niño?

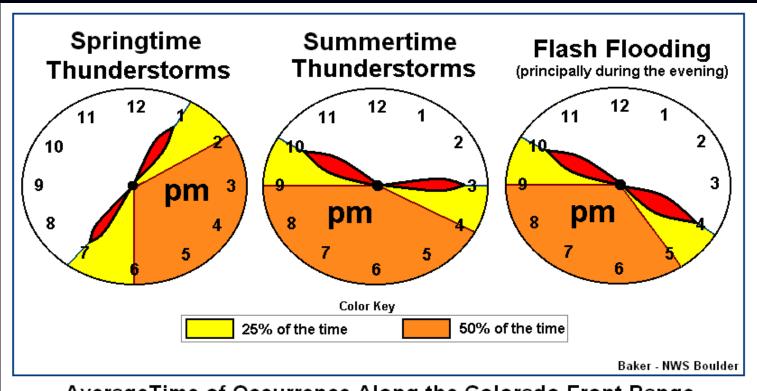
Unfortunately, the number of Junes since 1950 matching these scenarios is quite small. However, using data from nine Junes to answer the first question, and ten Junes to answer the second, there does not seem to be any clear answers to these questions.

Although when averaged together, June precipitation at Denver for both situations is slightly lower than the average for all Junes from 1950-2011.

## **June Temperatures During ENSO-Neutral Conditions**



How about temperature in Denver during ENSO neutral summers (May-September)? Based on 19 separate years since 1980, it is revealed above that the average monthly temperature for May, July, August and September was slightly below average, and slightly above average for June. The overall monthly average for these five months was very close to average (99.7%).



AverageTime of Occurrence Along the Colorado Front Range

During May and June, convection (i.e., thunderstorms) is likely to form first over the sun drenched east facing slopes of the Front Range late in the morning and early afternoon. These storm cells then move generally east over the adjacent high plains where they may initiate new storms later in the afternoon. (left diagram)

During July and August, thunderstorms development over and along the Front Range in northeast Colorado commonly occurs later in the afternoon. Thunderstorms on the plains also are more likely to linger well into the evening. (middle diagram) Flash Flooding - Thunderstorms, particularly those associated with the summer monsoon in July and August, are more likely to produce intense rainfall potentially resulting in flash flooding. This occurs more often during the late afternoon and evening hours when precipitable water is greater and steering winds are lighter. (right diagram)



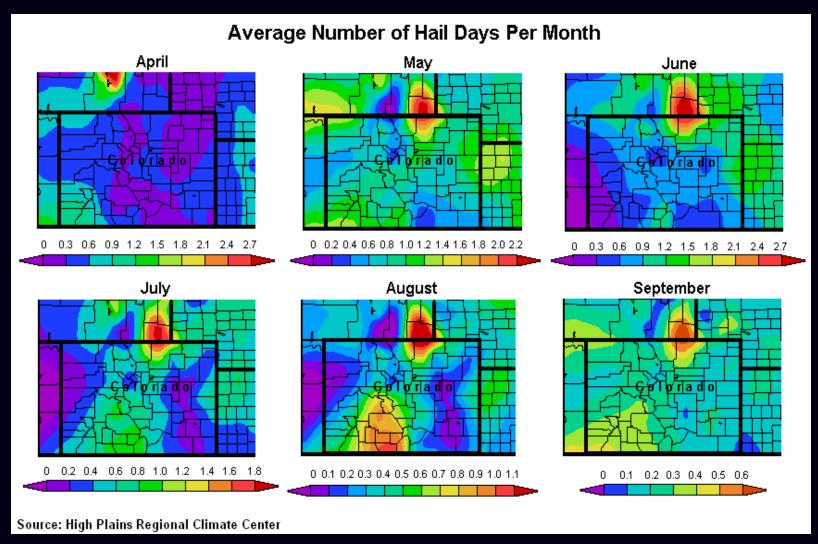
Hail poses a serious danger to life and property, especially when driven by powerful thunderstorm winds.

## The Hail Season is Upon Us

The lee side of the Rocky Mountains, specifically northeast Colorado, southeast Wyoming and western Nebraska experience the greatest frequency of hail, the largest average hailstone sizes and the longest hail storm durations in the nation, making this region the "hail capital of North America.".

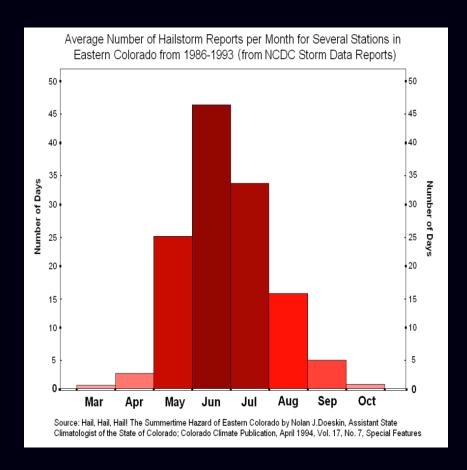
Stanley A. Changnon, David Changnon and Steven D. Hilberg, "Hailstorms Across the Nation – An Atlas About Hail and Its Damages", Illinois State Water Survey, Champaign, IL November 2009





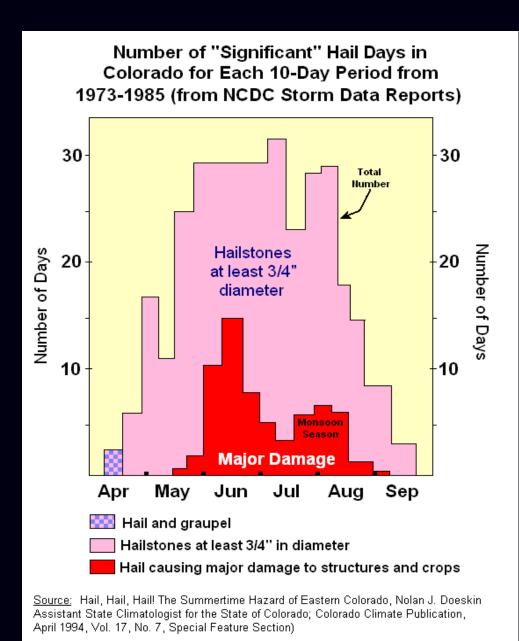
Cheyenne, Wyoming and its surroundings, including northeastern Larimer and northern Weld Counties in northern Colorado, are at the center of the "Hail Capital of North America".

Other areas with a high frequency of hail days during the summer season include northwest Kansas, western Nebraska, as well as southwest and northeast Colorado including the elevated terrain between Denver and Colorado Springs known as the Palmer Divide.



The hail season in eastern Colorado runs generally from late April through early September, with it peaking during the month of June. By August, hailstorm frequency decreases significantly as the late summer atmosphere becomes drier and more stable.

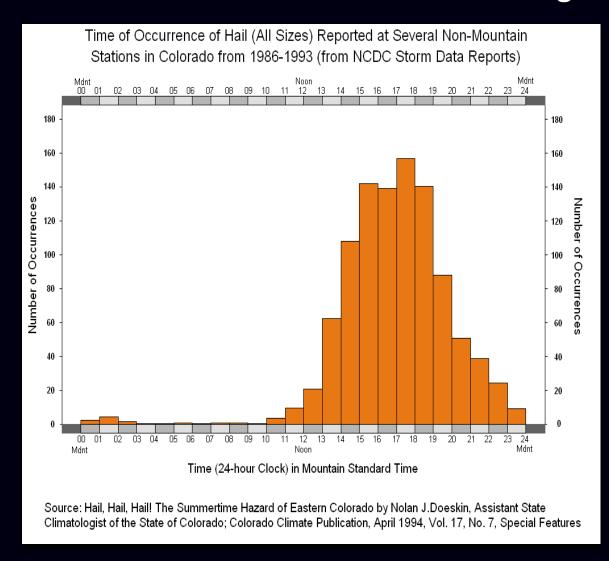




The average number of "significant" hail days reported in Colorado (days when thunderstorms produce hailstones of at least ¾ inch in diameter), increases dramatically during the latter half of May, and peaks during the months of June and July. Hail falling during June and early July, on average, results in the lion's share of major damage to property and crops in eastern Colorado.

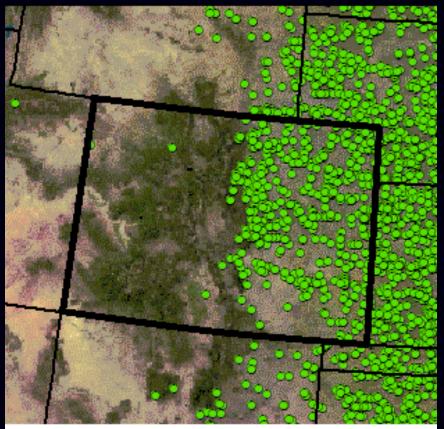
A second peak in damaging hail storms (see diagram) in late July and early August is associated with elevated thunderstorm activity during the summer monsoon." Though hailstones may be larger in size during this period, the extent of damage they cause is usually not as great.

#### The Occurrence of Hail Producing Thunderstorms



Thunderstorms in Colorado often form first over the solar heated slopes of the mountains around midday, before venturing out over the surrounding plains and valleys. This initial wave of convection (thunderstorms) may then produce outflow boundaries that serve to initiate further storm development on the plains.

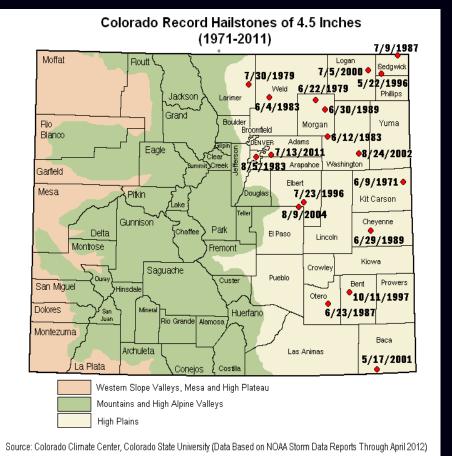
In a hail study conducted by Nolan Doeskin, at the time the Assistant State Climatologist for the State of Colorado, it was determined that hail producing thunderstorms in non-mountain locations of Colorado are more likely to occur in late afternoon during maximum solar heating. (see diagram at left)



NOAA/NWS Severe Storms Prediction Center

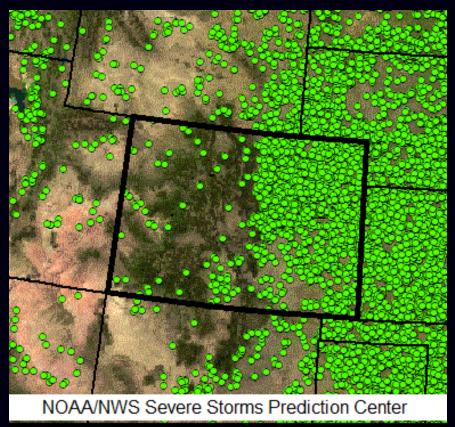
Significant Hail -2 Inches and Greater 1955 to 2010

Colorado Outlined in Black



Dates of Significant Hail –

4.5 Inches in Diameter 1971-2011



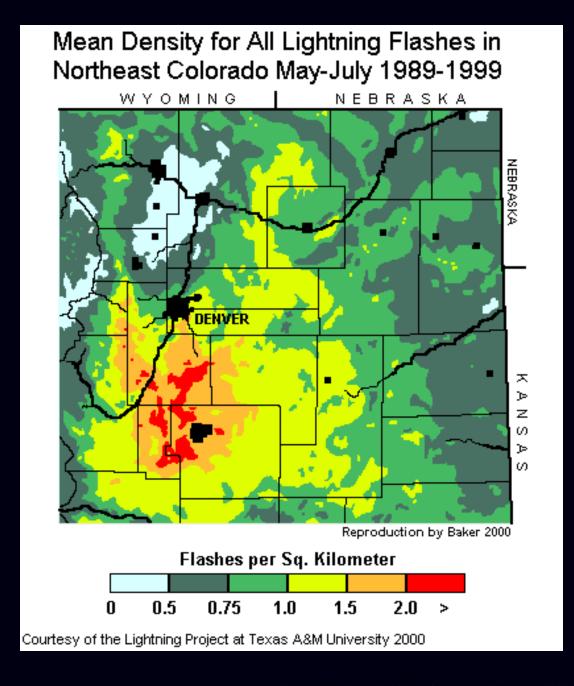
**Tornado Touchdown Points** 

from 1950-2010

Colorado Outlined in Black

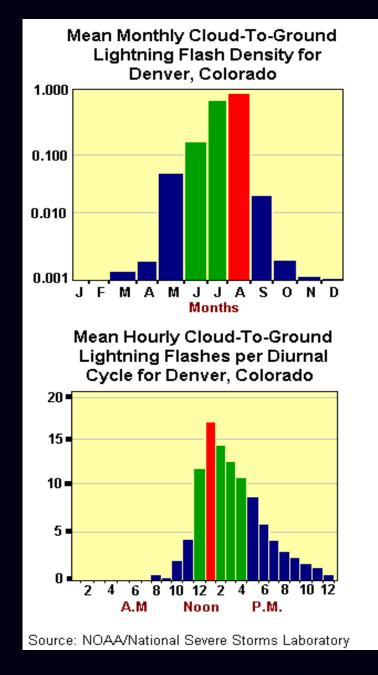
Colorado, especially eastern parts of the state, has seen its share of tornadoes since 1950.

The cluttering of tornadoes in northeast Colorado may be attributed to a greater population density in this part of the state.



In a study conducted by the Texas A&M University during 1989-1999, it was found that the greatest concentration of lightning flashes in northeast Colorado occurred over the elevated terrain known as the Palmer Divide or Monument Ridge between Denver and Colorado Springs.

The least lightning activity (positive and negative flashes) was documented over northern portions of the Front Range urban corridor around the cities of Loveland, Greeley and Fort Collins.

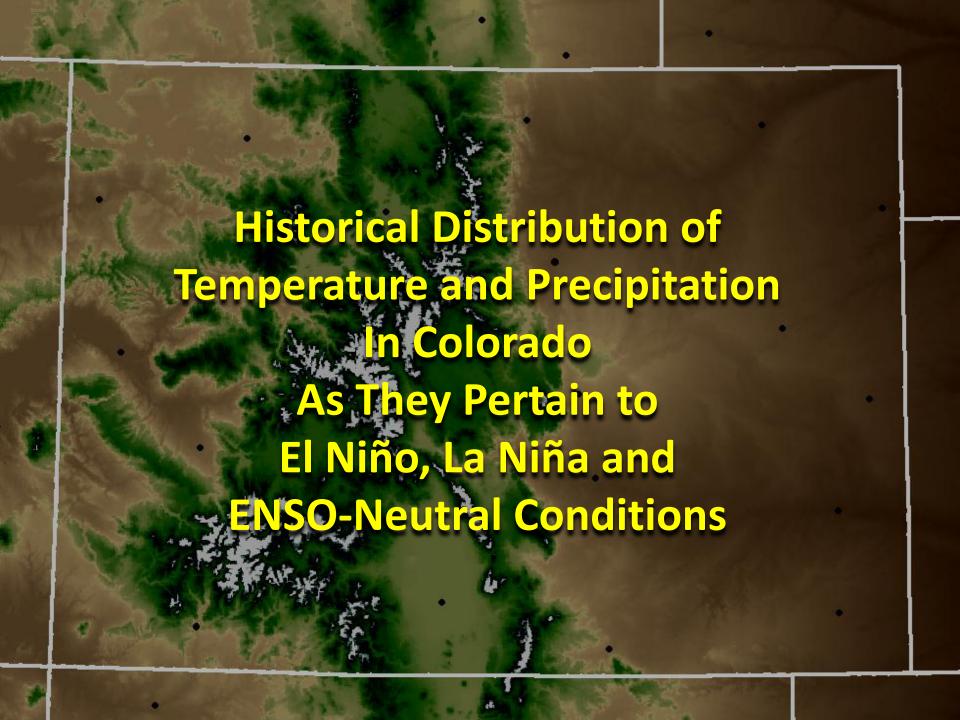


# The Lightning Threat Along the Colorado Front Range

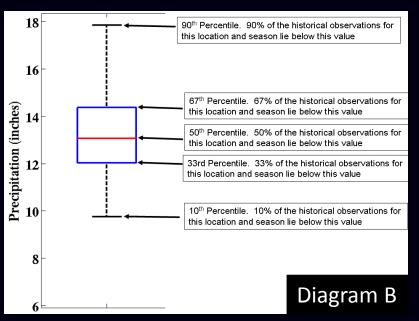
Along the Front Range in northern Colorado, lightning frequency increases steadily during the months of May, June and July, and peaks on average, during the month of August.

Lightning occurrence in the Denver area peaks, on average, early in the afternoon with the initial wave of thunderstorms moving off the Front Range. Lightning frequency will then decrease normally through the afternoon as storms move away from the Front Range.

However, lightning in the Denver area is more likely to occur later in the day as we move further into summer. This is largely due to increased warming aloft which can delay or even inhibit the formation of thunderstorms.



# Colorado Climate Divisions Northeast Colorado Div. 046 Southeast Colorado Div. 047 Div. 099 Diagram A



#### Interpreting ENSO Box and Whisker Plots

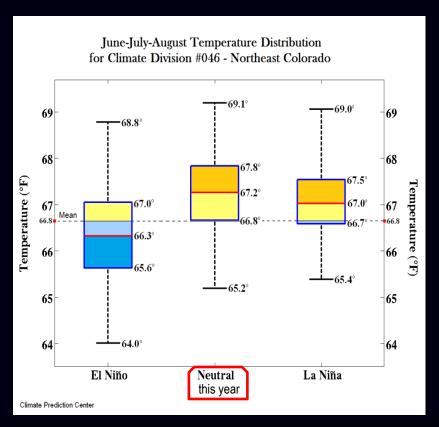
**Diagram A** is a map of the four climate megadivisions in Colorado used by the Climate Prediction Center (CPC)—Divisions 046, 047,048 and 099.

CPC has produced 3-month historical temperature and precipitation distribution plots for the three different ENSO categories —El Niño, La Niña and ENSO-neutral (non-ENSO) conditions for every climate mega-division in the United States.

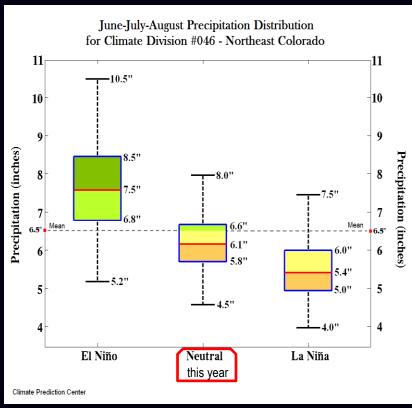
Diagram B is a description of the ENSO box and whisker analysis plot used by CPC to represent historical temperature and precipitation distributions for each ENSO category pertaining to each climate division.

The red line inside the ENSO box represents the mean or 50<sup>th</sup> percentile of the data (temperature or precipitation) distribution for each climate division. Approximately 34% of the total observations exist within the ENSO box, and the remaining observations (about 66%) lie outside of the box along the whiskers extending above and below the box.

# ENSO Box and Whisker Analysis Plots for the Northeast Colorado Climate Division #046 for the 3-Month Climate Season of June-July-August

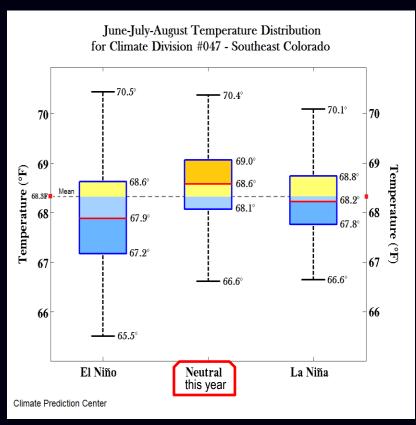


For the climate season June, July and August, temperatures in northeast Colorado historically have been slightly below average during El Niño conditions, above average during neutral ENSO conditions and slightly above average during past La Niña events.

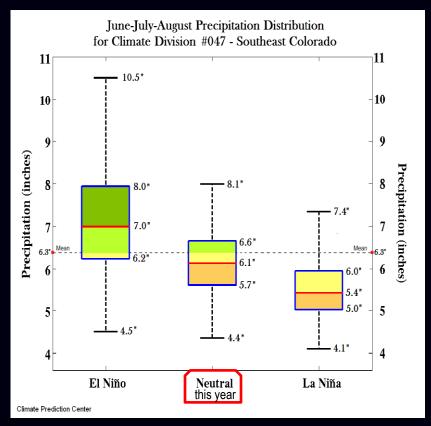


For the same three months, precipitation historically was above average during El Niños, slightly below average during neutral ENSO conditions, and below average during La Niñas. Note, these climate distributions do not take into account the strength of the ENSO (El Niño/La Niña) event.

## ENSO Box and Whisker Analysis Plots for the Southeast Colorado Climate Division #047 for the 3-Month Climate Season of June-July-August

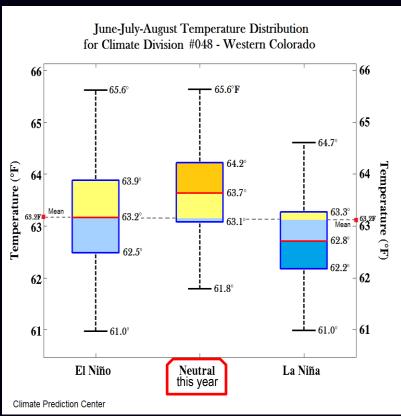


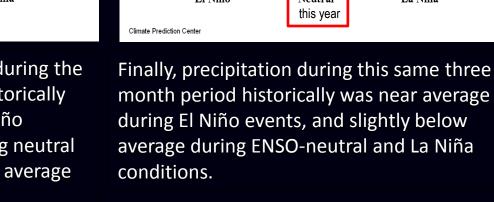
For the months of June, July and August, temperatures for southeast Colorado historically have been slightly below average during El Niño events, and slightly above average during neutral ENSO conditions, and near average during La Niña conditions.

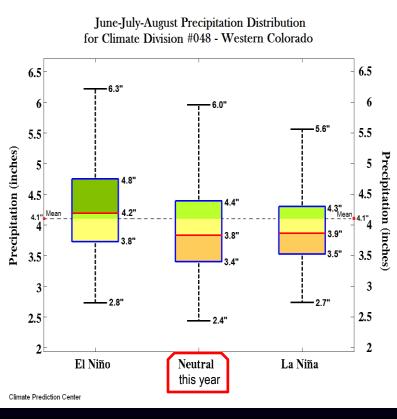


For the same three month period, precipitation was above average during El Niño events, near average during ENSO-neutral conditions, and below average during La Niña conditions.

## ENSO Box and Whisker Analysis Plots for the Western Colorado Climate Division #048 for the 3-Month Climate Season of June-July-August







Temperatures in western Colorado during the months of June, July and August historically have been near average during El Niño events, slightly above average during neutral ENSO conditions, and slightly below average during La Niña conditions.

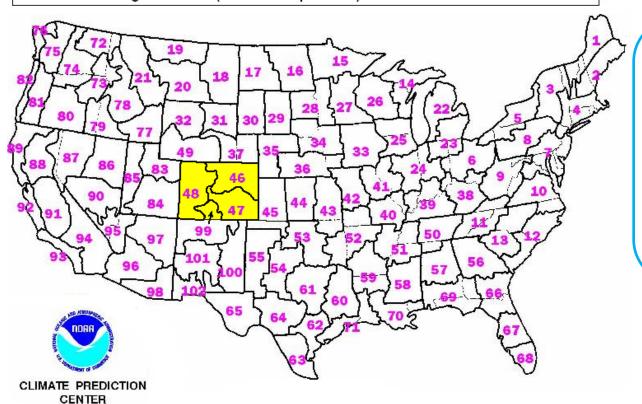
June-July-August 2012
Temperature and Precipitation
Outlook for Colorado
Prepared by NOAA's
Climate Prediction Center

#### **Climate Prediction Center Seasonal Outlooks**

The National Weather Service Seasonal Climate Outlooks predict the probability of conditions being among the warmest/coldest or wettest/driest terciles of years compared to the period of record 1981-2010.

The outlooks indicate probability of being in three specific categories in reference to the 30-year climatology from 1981-2010. They are above, below and average.

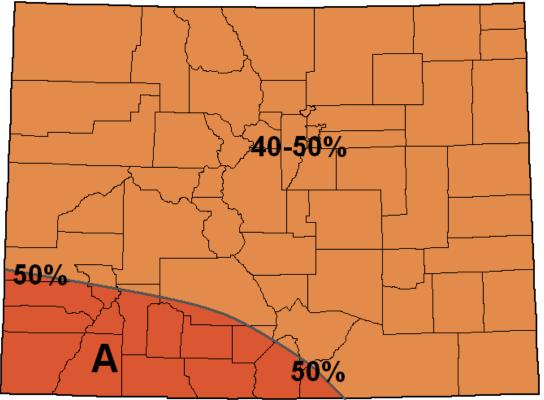
Remember, Climate Predicition Center (CPC) outlooks are made at the scale of the climate megadividions (see the map below).



#### Remember:

CPC outlooks do not infer any degree of warmness or coldness, or any quantity of precipitation; *only* their probability of occurrence.





One-Month Outlook Temperature Probability 0.5 Month Lead Valid June 2012 Made: 17 May 2012

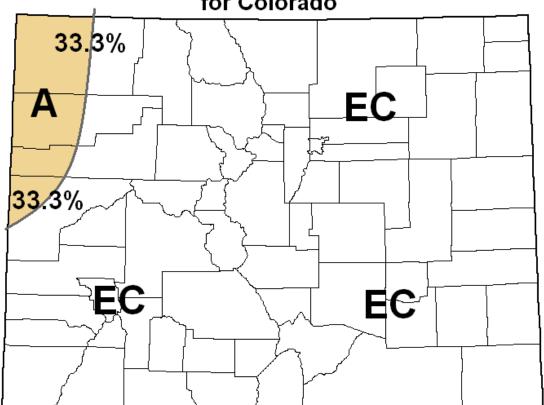
- A Means Above Normal (Average)
- N Means Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined)
  Chances for A, N and B

Source: NOAA/Climate Prediction Center

# June 2012 Temperature Outlook for Colorado

The temperature outlook for June calls for a 40 to 50 percent chance of above average temperature for all except the southwest corner of Colorado. The remaining section of the state has a 50-60% chance of above average temperature during the month of June according to NOAA's Climate Prediction Center.

#### June 2012 Precipitation Outlook for Colorado



One-Month Outlook Precipitation Probability 0.5 Month Lead Valid June 2012

Made: 17 May 2012

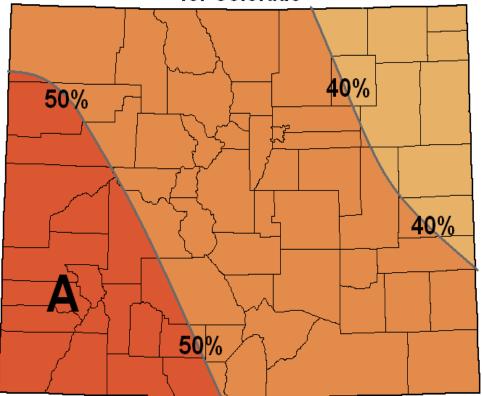
- A Means Above Normal (Average)
- Means Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined) Chances for A, N and B

Source: NOAA/Climate Prediction Center

#### **June 2012 Precipitation Outlook** for Colorado

The precipitation outlook for June calls for an equal or undetermined chance (EC) of above, below and near average precipitation for all except the extreme northwest corner of Colorado. The remaining section of the state has a 33.3 to 40 percent chance of above average temperature during June according to **NOAA's Climate Prediction** Center.

## June-July-August 2012 Temperature Outlook for Colorado



Three-Month Outlook Temperature Probability 0.5 Month Lead Valid JJA 2012

Made: 17 May 2012

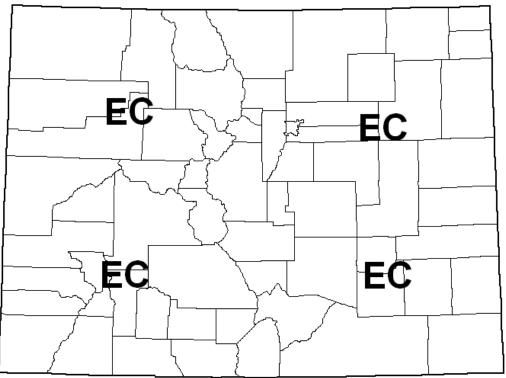
- A Means Above Normal (Average)
- N Means Normal (Average)
- B Means Below Normal (Average) EC Means Equal (or Undetermined) Chances for A, N and B

Source: NOAA/Climate Prediction Center

# June-July-August 2012 Temperature Outlook for Colorado

The temperature outlook for the months of June, July and August calls for a 33.3 to 40 percent chance of above average temperature across the northeast corner of Colorado, a 40 to 50 percent probability of above average temperature for central portions of the state, and a 50 to 60 percent chance of above average temperature for the southwest quarter of Colorado.

### June-July-August 2012 Precipitation Outlook for Colorado



Three-Month Outlook Precipitation Probability 0.5 Month Lead Valid JJA 2012

Made: 17 May 2012

- A Means Above Normal (Average)
- N Means Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined)
  Chances for A, N and B

Source: NOAA/Climate Prediction Center

# June-July-August 2012 Precipitation Outlook for Colorado

CPC's precipitation outlook for June, July and August calls for an equal or undetermined chance (EC) of above, below and near average precipitation for all of Colorado.